Systems Pharmacology and Computer-Aided Analysis of Chamomile for Predicting Potential Advantages and Adverse Effects.

Amir Zarrinhaghighi[1, 2], Bahareh Moazen[1, 2]

1. Pharmaceutical Systems Biology Research Center, Shiraz University of Medical Sciences, Shiraz, Iran

2. Student Research Committee, Shiraz University of Medical Sciences, Shiraz, Iran

Introduction

- Chamomile is the common name of daisy-like plants of the family Asteraceae. *Matricaria chamomilla L.* is the most common type of this plant. Chamomile is used in traditional medicine in different countries such as Traditional Chinese Medicine (TCM) and Traditional Iranian Medicine (TIM). Chamomile has many benefits in different medical conditions such as: fever, inflammation, muscle spasm, menstrual disorders, insomnia, ulcer, wounds, gastrointestinal disorders, rheumatic pain, hemorrhoid and etc. But further researches is necessary for the confirmation of them and many researches are planned for this purpose. Chamomile contains a wide range of compounds, and to identify their advantages it's crucial to investigate more. although multiplicity of this compounds makes the research difficult, virtual screening and computational methods help us make it easier. Furthermore, network analysis and systems pharmacology are powerful tools for this reason. So the present study was undertaken to identify properties of chamomile and possible toxic features of this plant.

Methods

- In this research known compounds of chamomile were collected from Dr. Duke's Phytochemical and Ethnobotanical Databases (https://phytochem.nal.usda.gov). After that ADME/tox properties of compounds were analyzed by Schrodinger Software and Online chemical modeling environment (OCHEM) web platform. Obtained data are Lipinski Rule of Five and oral bioavailability as drug-likeness criteria and mitochondrial membrane disruption, mutagenicity, CYP450 inhibition, EC50 and aquatic toxicity as toxic and adverse properties. Finally drug candidate compounds are selected between drug-like ligands without any toxic or adverse properties.

Discussion

- Analysis of compounds show potential usage and possible adverse properties of Chamomile. This study introduces a new method for having a better sight in experimental studies and helps us to walk on the right path for clinical trials on medicinal plants.

Results

List of compounds and their properties

Compounds	drug-like	Oral Absorbable	mitochondrial membrane disruptor	Mutagene	CYP450 Inhibitor	High EC50 (<1 mg/L)	Aquatic toxic
2,4-DIHYDROXYBENZOIC-ACID	*						
2,5-DIHYDROXYBENZOIC-ACID	*						
3,4-DIHYDROXYCINNAMIC-ACID	*						
3-Carene	*	*					
4-HYDROXY-3-METHOXY-BENZOIC-ACID	*	*					
4-METHOXYBENZOIC-ACID	*	*					
6-HYDROXY-LUTEOLIN-7-GLUCOSIDE			*	*			
6-METHOXYKAEMPFEROL	*		*	*	*		
alpha-Bisabolol	*	*					
ALPHA-BISABOLOL-OXIDE-A	*	*				*	
ALPHA-BISABOLOL-OXIDE-B	*	*				*	
ALPHA-BISABOLOLOXIDE-C						*	
ALPHA-BISABOLONEOXIDE-A						*	
ANTHECOTULIDE	*	*					
Apigenin	*		*	*	*		
APIGENIN-7-(6'O-ACETYL)-GLUCOSIDE			*	*			
APIGENIN-7-ACETYLGLUCOSIDE			*	*			
APIGENIN-7-APIOSYLGLUCOSIDE			*			*	
APIGENIN-7-GLUCOSIDE			*	*			
APIGENIN-7-GLUCOSIDE-(3',4')-DIACETATE			*	*			
APIGENIN-7-O-NEOHESPEROSIDE						*	
Apigenin-7-O-rutinoside						*	
Apigetrin			*	*			
apiin			*			*	
ASCORBIC-ACID	*						
Axillarin	*		*	*	*		
Azulene	*	*		*	*		
beta-Damascenone	*	*					
BETA-SITOSTEROL			*				
BETA-SITOSTEROL-GLUCOSIDE			*			*	
BORNYL-ACETATE	*	*					
CAPRIC-ACID	*	*					
CAPRYLIC-ACID	*	*					
CARYOPHYLLENEPOXIDE	*	*			*	*	
CHAMAVIOLIN	*	*	*	*	*		
Chamazulene					*		
CHAMOMILLOL	*	*	*				
Chrysoeriol	*	*	*	*	*		
CHRYSOERIOL-7-GLUCOSIDE			*	*		*	
CHRYSORIOL-7-RUTINOSIDE						*	
CHRYSOSPLENETIN	*		*		*	*	*
CIS-EN-YN-DICYCLOETHER	*	*				*	
Desacetylmatricarin	*	*					
D-glucosamine						*	
EO			*		*		
ETHYL-BENZOATE	*	*			*		
ETHYL-DECANOATE	*	*					
ETHYL-PALMITATE							*
ETHYL-PHENYLACETATE	*	*			*		
EUPALETIN	*	*	*		*	*	
EUPATOLETIN	*		*	*	*		
Farnesene						*	
Farnesol	*	*					
Fructose	*						

Compounds	drug-like	Oral Absorbable	mitochondrial membrane disruptor	Mutagene	CYP450 Inhibitor	High EC50 (<1 mg/L)	Aquatic toxic
furfural	*	*					
galactose						*	
GALACTURONIC-ACID	*						
GERANIOL	*	*					
glucose	*						
guaiazulene					*		
Herniarin	*	*			*		
Hyperoside							
ISOFERULIC-ACID	*	*					
Isorhamnetin	*		*	*	*		
ISORHAMNETIN-7-GLUCOSIDE				*		*	
JACEIDIN	*		*	*	*	*	
Kaempferol	*		*	*	*		
LEVONENOL	*	*					
LINOLEIC-ACID	*	*			*		
LUTEOLIN	*		*	*	*		
LUTEOLIN-4'-GLUCOSIDE			*	*	*		
Luteolin-7-glucoside			*	*	*		
Luteolin-7-O-glucoside			*	*	*		
LUTEOLIN-7-RHAMNOGLUCOSIDE				*		*	
MALIC-ACID							
Matricarin	*	*					
Matricin	*	*					
Niacin	*	*					
O-COUMARIC-ACID	*	*					
OLEANOLIC-ACID			*				
OLEIC-ACID	*	*			*		*
PALMITIC-ACID	*	*					*
Patuletin	*		*	*	*		
PATULETIN-7-GLUCOSIDE				*		*	
P-COUMARIC-ACID	*	*					
PECTIC-ACID	*						
PERILLYL-ALCOHOL	*	*					
Polyacetylene	*	*		*			
QUERCETAGETIN-3,5,6,7,3',4'-HEXAMETHYLETHER			*		*	*	
QUERCETAGETIN-3,6,7,3',4'-PENTAMETHYLETHER			*		*	*	
Quercetin	*		*	*	*		
QUERCETIN-7-GLUCOSIDE	*		*	*			
Quercetrin	*		*	*			
Quercimeritrin			*	*			
Rhamnose	*					*	
salicylic-acid	*	*					
SINAPIC-ACID	*						
spathulenol	*	*					
SPINACETIN	*		*	*	*		
STIGMASTEROL			*				
Tannin			*				
Thiamin				*			
THUJONE	*	*					
trans-beta-Farnesene					*		
TRANS-EN-YN-DICYCLOETHER	*	*				*	
TRIACONTANE							
Umbelliferone	*	*			*		
Xanthoxylin	*	*					
xylose	*						

Drug-Candidates (Without any toxic or adverse properties)

3-Carene	4-HYDROXY-3-METHOXY-BENZOIC-ACID	4-METHOXYBENZOIC-ACID	alpha-Bisabolol
ANTHECOTULIDE	beta-Damascenone	BORNYL-ACETATE	CAPRIC-ACID
CAPRYLIC-ACID	Desacetylmatricarin	ETHYL-DECANOATE	Farnesol
furfural	GERANIOL	ISOFERULIC-ACID	LEVONENOL
Matricarin	Matricin	Niacin	O-COUMARIC-ACID
P-COUMARIC-ACID	PERILLYL-ALCOHOL	salicylic-acid	spathulenol
THUJONE			Xanthoxylin

Contact info

- Amir Zarrinhaghighi
- Email: Zarrinhaghighi.a@gmail.com
- Phone number: +989377936370

Reference

- Jalali S, Zarrinhaghighi A, et al. (2018) A Systems Pharmacology Study for Deciphering Anti Depression Activity of *Nardostachys jatamansi*. Current Drug Metabolism. 3:19.
- Sushko I, Salmina E, Potemkin V, Poda G and Tetko I. (2012) ToxAlerts: A Web Server of Structural Alerts for Toxic Chemicals and Compounds with Potential Adverse Reactions. *Journal of Chemical Information and Modeling.8:52*